

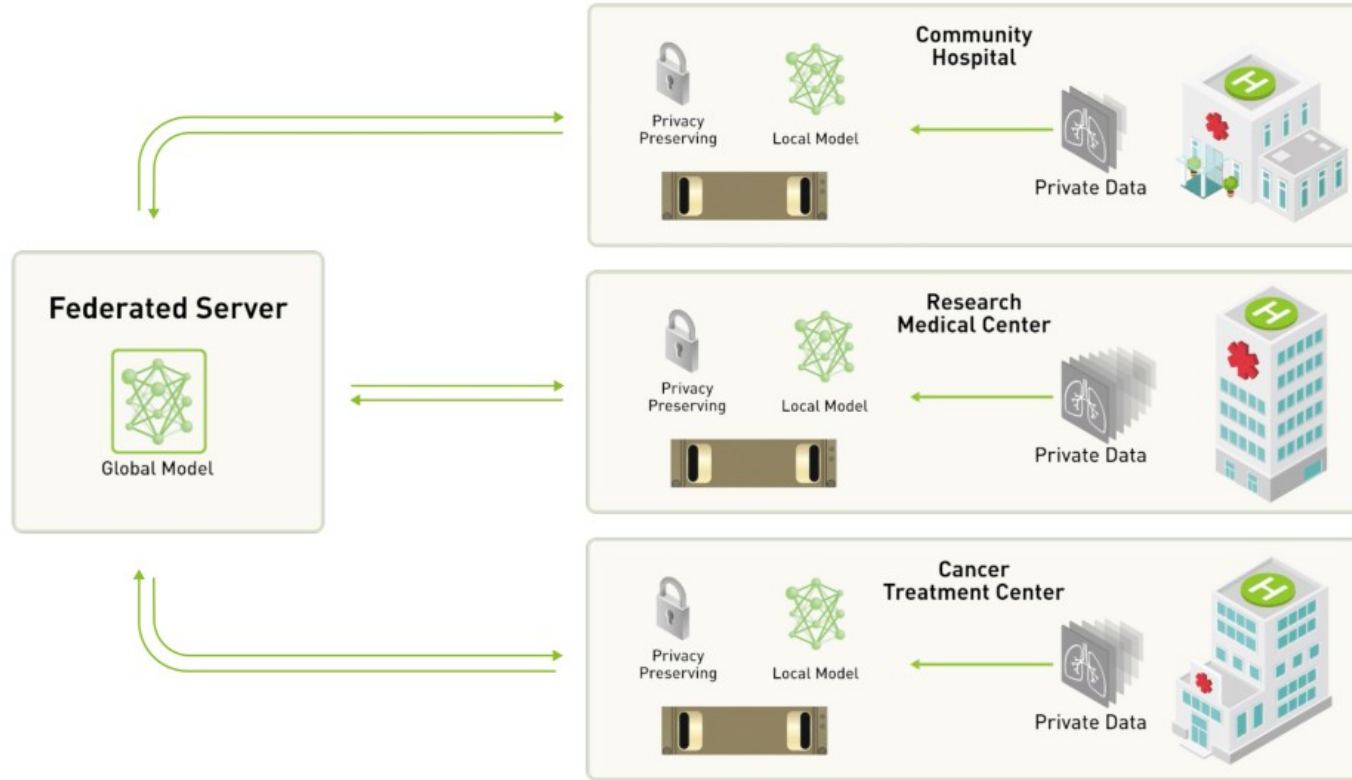


FEDERATED LEARNING

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ARCHITECTURE



<https://github.com/NVIDIA/clara-train-examples/blob/master/PyTorch/NoteBooks/FL/FederatedLearning.ipynb>



TASKS - DONE

- Connect to remote machine
- Change model, data-set
- Provisioning federated learning tool
- Run admin to orchestrate the FL experiment
- Clients join the FL experiment
-
- Build Global model using FedAvg, FedMA aggregation schemes
- Compare performance



REMOTE MACHINE

- Install zerotier
- Join remote network
- Connect to remote machine



REMOTE MACHINE – Install zerotier

- ZeroTier creates secure networks between on-premise, cloud, desktop, and mobile devices.
- combines the capabilities of VPN and SD-WAN, simplifying network management.

```
curl -s https://install.zerotier.com | sudo bash
```



REMOTE MACHINE – Join Network

- Join the network using the pre-shared ID

```
zerotier-cli join NETWORK_ID
```



REMOTE MACHINE – Connect to Machine

- After join approval, and sharing the SSH public key
- Connect to machine using private SSH key

```
ssh muhammad@IP
```



DATA-SET

- The data-set was replaced as it had missing config files.
- Split the data-set over 3 clients (50%, 25%, 25%)



MODEL

- Model was replaced with a compatible spleen model to match the data-set



IMAGE

```
docker run -it --shm-size=1G --ulimit memlock=-1 --ulimit  
stack=67108864 --ipc=host --net=host --mount  
type=bind,source=/home/DATA/Task09_Spleen,target=/workspace/data  
deepc_fl /bin/bash
```

- In case of changes to the image, commit changes

```
docker ps  
  
docker commit [CONTAINER_ID] deepc_fl
```



PROVISIONING

- Setup starting packages for
 - Server
 - Admin
 - Client1
 - Client2
 - Client3
- Edit config files:
 - ``opt/nvidia/medical/tools/project.yml``



RUN PARTICIPANTS

- For each of the participants run a new docker image in a new terminal
- Go to the corresponding `startup` folder
- Run `sh start.sh` in order to run their service



RUN PARTICIPANTS

Server

In a new docker container, go inside
`opt/nvidia/medical/tools/packages/server/startup/` and run:

```
sh start.sh
```

Clients

In a new docker container, go inside `/packages/client1/startup/` and run:

```
sh start.sh
```

Admin

In a new docker container, go inside `/packages/admin/startup/` and run:

```
sh fl.admin.sh
```

in the admin window type the admin e-mail `admin@nvidia.com`



ADMIN CLIENT

```
> check_status server
FL run number has not been set.
FL server status: training not started
Registered clients: 3
```

CLIENT NAME	TOKEN	SUBMITTED MODEL

org1-a	9d78aa21-93e2-4721-b0db-72e631b12e18	
org1-b	8cd3fb28-1210-47f3-a122-544ccd2efed2	
org2	275b0315-9305-443c-858d-220b44c7a805	

```
-----
Done [7316 usecs] 2021-07-09 14:31:00.641830
```



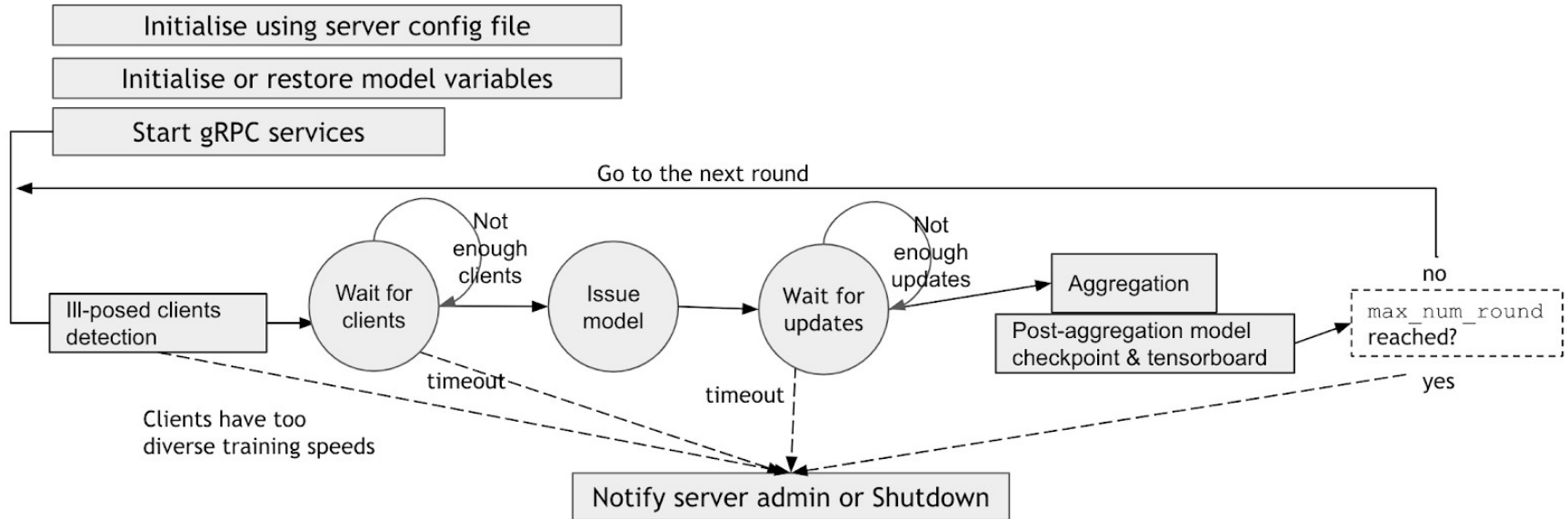
ADMIN CLIENT

```
> check_status client
instance:org1-a : client name: org1-a   token: 9d78aa21-93e2-4721-b0db-
72e631b12e18      status: training not started
instance:org1-b : client name: org1-b   token: 8cd3fb28-1210-47f3-a122-
544ccd2efed2      status: training not started
instance:org2 : client name: org2       token: 275b0315-9305-443c-858d-
220b44c7a805      status: training not started

Done [407687 usecs] 2021-07-09 14:31:05.973040
```

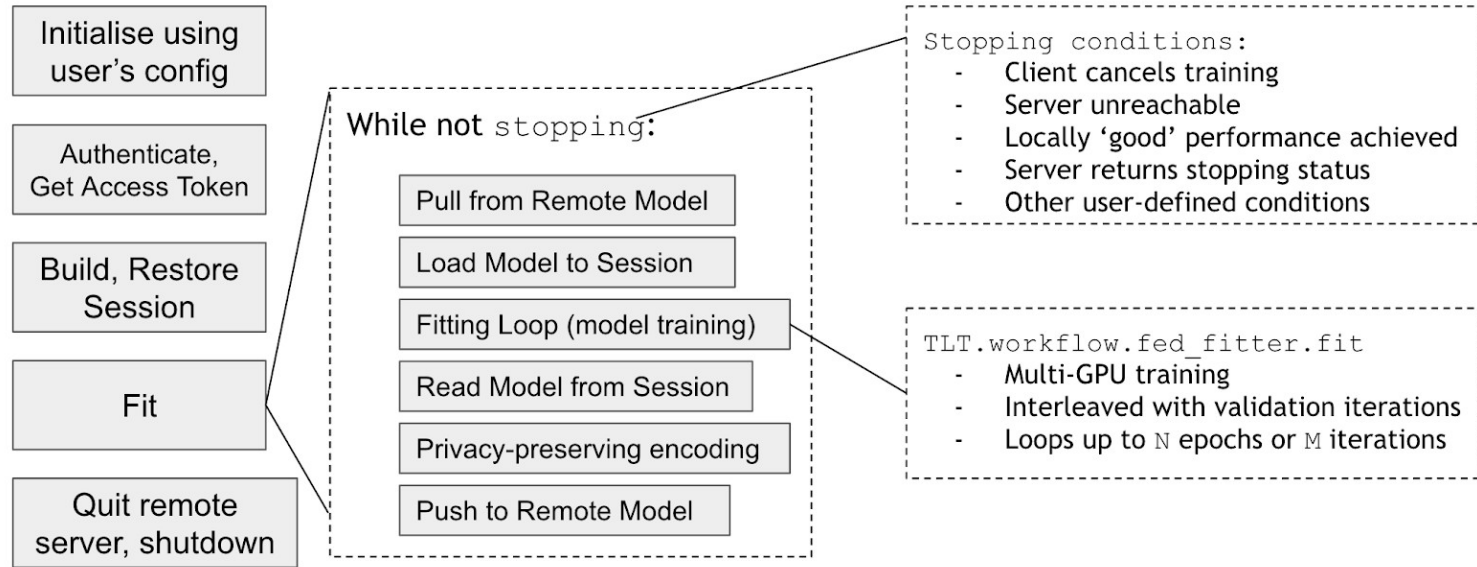


SERVER CYCLE



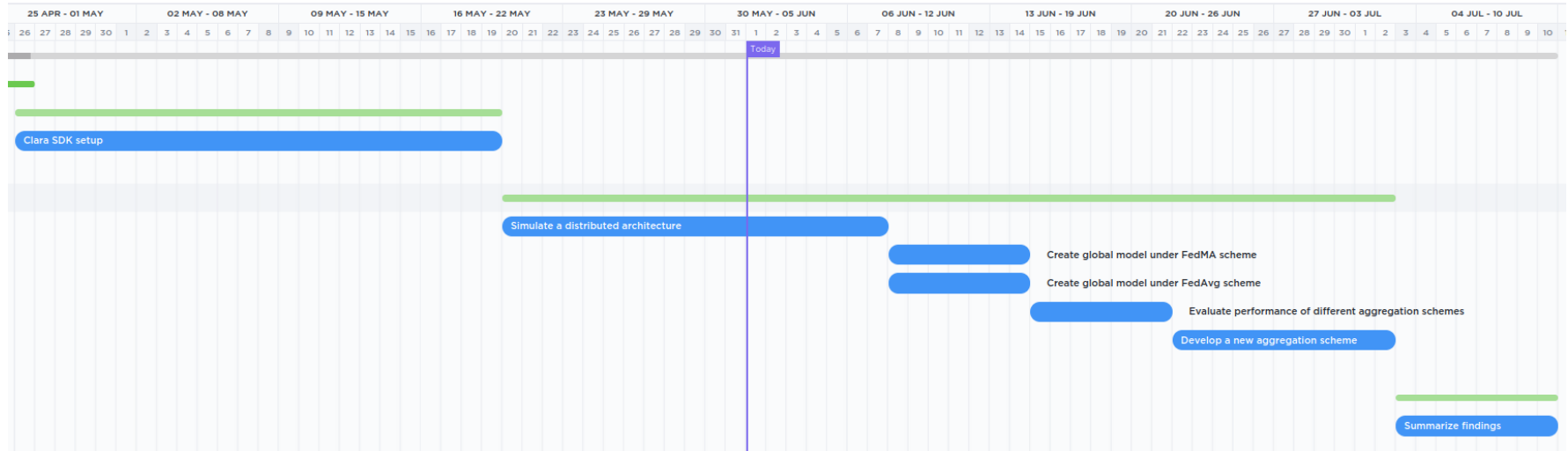
<https://github.com/NVIDIA/clara-train-examples/blob/master/PyTorch/NoteBooks/FL/FederatedLearning.ipynb>

CLIENT CYCLE



<https://github.com/NVIDIA/clara-train-examples/blob/master/PyTorch/NoteBooks/FL/FederatedLearning.ipynb>

GANTT CHART





QUESTIONS?



THANK YOU!

REFERENCES

- <https://www.digitalocean.com/community/tutorials/how-to-install-and-use-docker-on-ubuntu-20-04>
- <https://github.com/NVIDIA/clara-train-examples/blob/master/PyTorch/NoteBooks/FL/FederatedLearning.ipynb>

